epiTRENDS

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Unusual *E. coli* Outbreak in Southwest Washington Has Been Traced to Contaminated Lake Water

Transmission of *E. coli* O157:H7 by swimming in unchlorinated, recreational water is a recognized though infrequent cause of outbreaks. In the United States, only three lake-associated outbreaks of *Escherichia coli* O157:H7 have been reported in the literature, the first in 1991 in Oregon (Keene, *N Engl J Med* 1994; 331:579–84).

On Saturday, August 28, 1999, Southwest Washington Health District and the Washington State Department of Health received reports of four cases of *E. coli* O157:H7 infection among children who resided in Clark County. Interviews of the children's parents revealed that three of the children had swum on August 20–21 in Battle Ground Lake, a popular, spring-fed lake in the northern part of the county; one secondary case was linked to a sibling swimmer. On August 28, the Health District closed the swimming beach and initiated an investigation.

During the summer the Health District had been investigating eight cases of *E. coli* O157:H7 with onsets in June, July, and early August. Three cases were believed due to secondary transmission; none of the infected persons reported swimming in Battle Ground Lake and no common exposure could be determined. One child developed hemolytic uremic syndrome (HUS).

The week before the lake-associated cluster was recognized, a second child was hospitalized with HUS. This child reported swimming at Battle Ground Lake on August 14. Samples of lake water obtained August 26 showed fecal coliforms at 18 and 93 counts per 100 ml, which did not exceed the Washington State water quality standard of 100 fecal coliforms per 100 ml.

To identify additional cases, Health District staff phoned infection control practitioners, laboratories, and pediatric infectious disease specialists, issued daily press releases, and informed the medical community through the fax alert system.

Case Characteristics

Health officials identified 36 persons with *E. coli* O157:H7 (35 confirmed on stool culture and one by serology). Of these, 28 persons reported swimming at Battle Ground Lake between August 14 and 28; the other eight were contacts of swimmers (Figure 1, page 2). Twenty-three cases (65%) occurred in children under age 10 (range for total cases, 8 weeks to 39 years; median age 5.5 years), and 24 (67%) of those infected were males. Seven persons were hospitalized, including three children with HUS, but none died. Sixteen cases (44%) were reported from the towns of Battle Ground or Brush Prairie. Reports of 17 cases (47%) came from other parts of the county, while two (6%) came from Multnomah County, Oregon, and one (3%) came from Pierce County.

Case-Control Study

To determine risk factors for infection, health officials used a standardized questionnaire to obtain information from all confirmed cases and two sets of control subjects: (1) children 1 to 14 years old whose families were registered to camp at Battle Ground Lake State Park, and (2) area residents under 15 years old identified by sequential forward-digit dialing.

Analysis of data has shown that swimming in Battle Ground Lake was associated with *E. coli* O157:H7 infection and that risk increased with specific water activities, swallowing water, and having water in one's mouth. Other potential exposures such as ground beef and milk were not associated with illness. *Continued page 2*

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E. coli *(from page 1)*

Laboratory Findings

Stool samples with isolates serotyped as presumptive *E. coli* O157:H7 were sent to the Washington State Public Health Laboratory (WPHL) for confirmation. Results of DNA fingerprinting by pulsed-field gel electrophoresis (PFGE) showed a consistent "outbreak pattern" in all 35 isolates tested.

Scientists at WPHL and an independent research team at the University of Washington identified *E. coli* O157:H7 in lake sediment, lake water, and freshly formed feces from a duck. Further, the genetic fingerprint of these isolates exactly matched the outbreak pattern in swimmers and their contacts. To our knowledge this is the first time that *E. coli* O157:H7 has been isolated from a freshwater lake.

Environmental Investigation

Battle Ground Lake is a 28-acre volcanic lake with a shallow, sandy bathing beach. An estimated 400 day users and 220 overnight campers visit the park on an average summer day, and up to 1000 on a busy weekend during nice weather.

On August 29, the day following lake closure, Health District environmental specialists inspected the park and found no leakage in the bathroom facilities, sewage system, or drainfield. No leaks were revealed by fluorescein dye studies. Water samples obtained from drinking fountains near the swim beach were negative for coliform bacteria. No irregularities were detected in a review of procedures and operations of the food concessionaire.

No cattle farms are adjacent to the park. Equestrian trails abut the northern park boundary, but are situated up a hill in an area a half mile across the lake from the swimming beach, with drainage directed away from the lake. Animal visitors to the lake include waterfowl, deer, and dogs.

Duck Presumed Innocent

The finding of *E. coli* O157:H7 in duck feces needs further study and interpretation. Most likely, the duck picked up the bacteria from the lake water rather than being the source of transmission. *E. coli* O157:H7 has been isolated from fecal samples from seagulls and geese. The most likely explanation for the outbreak is contamination of the lake by human feces.

Control Measures

The lake will remain closed to wading, swimming, boating, and fishing until next spring. A technical group is addressing methods for prevention of fecal contamination. To prevent secondary transmission, health officials sent letters to schools and daycare facilities emphasizing the need to exclude symptomatic children and to practice careful handwashing. A state and local collaborative group is meeting to consider measures for decreasing the risk of waterborne illness and injury at beaches and recreational waters.

For More Information

For further information contact: Karen R. Steingart, MD, MPH, Health Officer, Southwest Washington Health District, tel: 360-397-8412, ksteingart@aol.com; or Michael G. Bruce, MD, MPH, Medical Epidemiologist, Communicable Disease Epidemiology Section, Washington State Department of Health, tel: 206-361-2844.

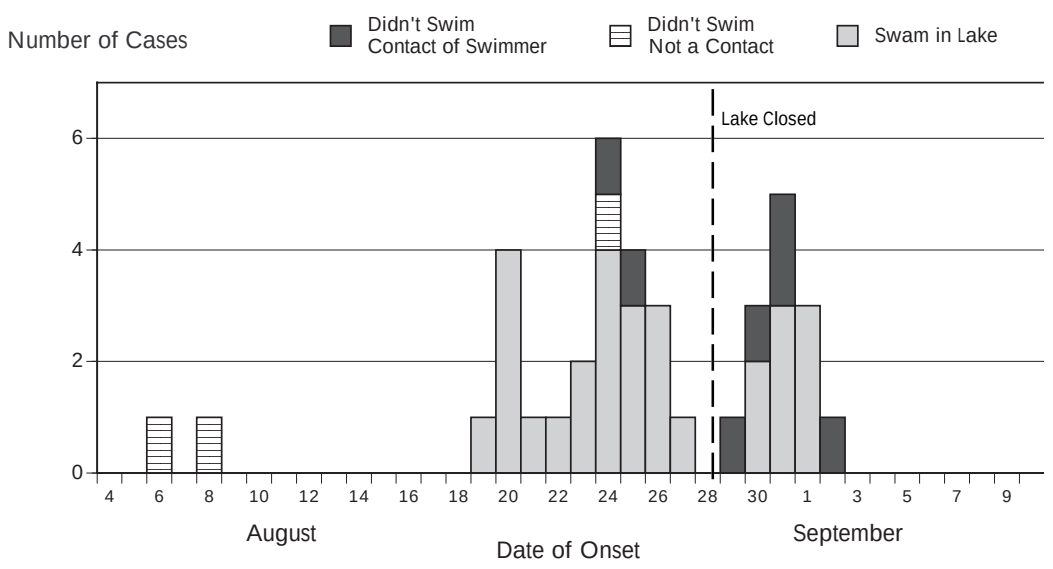

FIGURE 1:
***E. coli* O157:H7 cases in Clark County, summer 1999**

Monthly Surveillance Data by County

October 1999* – Washington State Department of Health

County	E. coli O157:H7	Salmonella	Shigella	Hepatitis A	Hepatitis B	Non-A, Non-B Hepatitis	Meningococcal Disease	Pertussis	Tuberculosis	Chlamydia	Gonorrhea	AIDS	Pesticides†	Lead§#
Adams	0	1	0	0	0	0	0	0	0	1	0	0	1	0/15
Asotin	0	0	0	0	0	0	0	0	0	1	0	0	1	0/0
Benton	1	1	0	0	0	0	1	0	1	20	0	0	0	0/22
Chelan	0	0	0	0	0	0	0	0	1	6	1	0	1	2/33
Clallam	0	2	0	0	0	0	0	0	0	3	0	0	0	0/0
Clark	4	4	2	6	2	2	1	2	1	39	9	2	0	1/10
Columbia	0	0	0	0	0	0	0	0	0	0	0	0	0	0/0
Cowlitz	0	0	0	0	0	0	0	0	0	9	1	0	0	3/21
Douglas	0	0	0	0	0	0	0	0	0	7	1	0	0	0/15
Ferry	0	0	0	0	0	0	0	0	0	0	0	0	0	0/0
Franklin	1	1	0	0	0	0	0	0	0	14	0	0	0	0/6
Garfield	0	0	0	0	0	0	0	0	0	0	0	0	0	0/0
Grant	0	0	0	1	0	0	0	0	0	12	0	1	2	0/34
Grays Harbor	0	0	1	0	0	0	0	0	0	5	1	0	0	0/#
Island	0	0	0	1	0	0	0	1	0	2	0	0	0	0/6
Jefferson	0	0	0	0	0	0	0	0	0	3	0	0	0	0/#
King	4	12	1	0	0	2	0	27	10	332	102	17	1	2/66
Kitsap	0	4	0	1	0	0	0	2	1	50	16	0	1	0/16
Kittitas	0	0	0	0	0	0	0	0	0	0	0	0	0	0/#
Klickitat	0	1	0	0	0	0	0	0	0	0	0	0	1	0/0
Lewis	0	1	0	0	0	0	0	0	0	10	2	0	0	0/0
Lincoln	0	0	0	0	0	0	0	0	0	0	0	0	0	0/0
Mason	0	1	0	0	1	0	0	0	1	9	3	0	0	0/6
Okanogan	0	0	0	0	0	0	0	0	2	2	0	0	1	0/10
Pacific	0	0	0	0	0	0	0	0	0	1	0	0	0	0/#
Pend Oreille	0	0	0	0	0	0	0	0	0	1	0	0	0	0/#
Pierce	2	7	2	1	0	0	0	2	3	164	45	2	0	0/57
San Juan	0	0	0	0	0	0	0	0	0	0	0	0	0	0/14
Skagit	0	2	0	0	0	0	0	0	0	7	1	0	0	1/9
Skamania	0	0	0	0	0	0	0	0	0	0	0	0	0	0/0
Snohomish	1	7	0	9	0	0	0	6	1	101	10	1	1	0/31
Spokane	2	0	0	0	0	0	0	0	2	38	9	0	2	0/30
Stevens	1	3	0	0	0	0	0	0	0	2	0	0	0	0/#
Thurston	0	4	0	1	0	0	0	2	1	17	3	0	1	0/5
Wahkiakum	0	0	0	0	0	0	0	0	0	1	0	0	0	0/0
Walla Walla	1	0	0	0	0	0	0	0	0	1	0	0	0	0/#
Whatcom	0	2	1	1	0	0	0	1	0	24	1	0	1	0/#
Whitman	0	1	0	0	0	0	0	0	0	7	1	0	0	0/#
Yakima	0	9	5	0	0	0	0	0	0	49	2	0	2	0/83
Unknown														0/0
Current Month	17	63	12	21	3	4	2	43	24	938	208	23	16	10/511
October 1998	18	12	26	39	6	4	3	20	23	872	190	34	16	8/283
1999 to date	136	545	99	283	58	17	59	623	215	9728	1727	299	263	89/3090
1998 to date	90	401	179	875	91	21	58	275	218	9267	1652	358	392	108/2853

* Data are provisional based on reports received as of October 31, unless otherwise noted.

† Unconfirmed reports of illness associated with pesticide exposure.

§# Number of elevated tests (data include unconfirmed reports) / total tests performed (not number of children tested); number of tests per county indicates county of health care provider, not county of residence for children tested; # means fewer than 5 tests performed, number omitted for confidentiality reasons.

DOH Releases Report on Statewide Cancer Data for 1997

The annual report of the Washington State Cancer Registry, *1997 Cancer in Washington*, is now available. It provides data on cancer of all sites combined and the 24 cancer sites most frequently diagnosed in Washington residents. As in previous reports, the information covers cancer incidence and mortality, stage at diagnosis, age- and gender-specific incidence, and county-specific incidence and mortality. The sections on annual trends and county-specific incidence and mortality include data for previous years. New for 1997 is a section with race-specific cancer incidence and mortality for three racial groups — Asian/Pacific Islanders, blacks, and whites.

State and county health agencies can use this information to identify the burden of morbidity and mortality associated with each type of cancer. Along with information on cancer prevention, early detection, and treatment, the data are useful for program planning and policy development. The report is posted on the DOH website at www.doh.wa.gov/EHSPHL/Epidemiology/wscr1.htm; or contact Colleen Graney at (360) 236-3676.

WWW
Access Tips

Information about influenza vaccine for the 1999–2000 season is available from the Centers for Disease Control and Prevention: http://www.cdc.gov/ncidod/diseases/flu/fluvac.htm

Laboratory Report in Washington Was First Alert That Led to Identification of a National Outbreak of Salmonella

A Salmonella outbreak traced to unpasteurized orange juice sickened 110 persons, primarily in Western Washington, in June and July (*epiTRENDS*, July 1999). Subsequent laboratory testing identified the islolate as *S. Muenchen*. Within a few weeks, 334 cases with *S. Muenchen* were identified in 20 states and three provinces. An unopened container of orange juice tested positive for *S. Muenchen*. Pulsed field gel electrophoresis (PFGE) of the isolates from case patients and the isolate from the juice showed indistinguishable patterns. Collaborative public health efforts allowed early recognition of the outbreak and recall of the orange juice product. Notification by a laboratory technician was crucial factor, and molecular testing confirmed the orange juice link identified by local and state health department epidemiologists. (See also *MMWR* July 16, 1999; 48(27):82–585.)

Influenza Season Begins

Flu season has begun n Washington; 29 cases of confirmed influenza A have been reported from 10 counties from October 1 through November 22, 1999 (1 Chelan, 8 King, 1 Kitsap, 1 Pierce, 1 Snohomish, 8 Spokane, 1 Stevens, 1 Thurston, 1 Whatcom, and 6 Whitman). To date, one long-term care facility has reported an outbreak and one school has reported over 10% absenteeism. In addition to influenza A, one influenza B isolate has been identified. Nationally, laboratory-confirmed influenza A infections have been reported in 35 states with two states reporting regional influenza activity.

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P.O. Box 47812
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